APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/584,641	01/23/2007	In-Kyeong Choi	123054-06080153	5024

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LOWE HAUPTMAN HAM & BERNER, LLP
1700 DIAGONAL ROAD
SUITE 300
ALEXANDRIA, VA 22314

EXAMINER
PHUONG, DAI

ART UNIT	PAPER NUMBER
2617	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *26 June 2006*.
2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-21* is/are pending in the application.
    4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☒ Claim(s) *1-19* is/are allowed.
6) ☒ Claim(s) *20* is/are rejected.
7) ☒ Claim(s) *21* is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on *26 June 2009* is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
    a) ☒ All   b) ☐ Some *   c) ☐ None of:
      1. ☒ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____.
      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1.   The references listed in the Information Disclosure Statement filed on 01/23/2007,

10/15/2007, 05/05/2009 and 07/20/2009 have been considered by the examiner (see attached

PTO-1449 form or PTO/SB/08A and 08B).

Claim Rejections - 35 USC § 103

2.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

3.   Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Borran et al.

(Pub. No.: 20050094740) in view of Hottinen (U.S. 7447270).

        Regarding claim 20, Borran et al. disclose a beam forming method for a MIMO-OFDM

system comprising a transmitter with L transmit antennas and a receiver with M receive

antennas, comprising:

        (a) converting continuously inputted symbols of a number of subcarriers to K parallel

signals (Fig. 1, [0031]);

        (b) reproducing K parallel signals by the number of transmit antennas (Fig. 1, [0031]).

        However, Borran et al. do not disclose (c) generating one eigenbeam for each group of

subcarriers, on the basis of the long-term feedback information corresponding to N.sub.f

eigenbeam forming vectors and the short-term feedback information corresponding to the group of subcarriers.

In the same field of endeavor, Hottinen disclose generating one eigenbeam for each group of subcarriers, on the basis of the long-term feedback information corresponding to $N.sub.f$ eigenbeam forming vectors and the short-term feedback information corresponding to the group of subcarriers (col. 2, lines 56-67 and col. 10, lines 33-62).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Borran et al. by specifically including generating one eigenbeam for each group of subcarriers, on the basis of the long-term feedback information corresponding to $N.sub.f$ eigenbeam forming vectors and the short-term feedback information corresponding to the group of subcarriers, as taught by Hottinen, the motivation being in order to improve controlling the weighting of data signal in the transceiver and avoid the received signal deteriorates.

Allowable Subject Matter

4.   Claim 21 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 1-19 are allowed.

Regarding claim 1, the prior art record fails to anticipate or render obvious a Multiple Input Multiple Output (MIMO)-Orthogonal Frequency Division Multiplexing (OFDM) system comprising a transmitter with L transmit antennas, a receiver with M receive antennas, and an

uplink feedback device for providing information of the receiver to the transmitter, wherein the

transmitter comprises: a serial/parallel converter for converting continuously inputted symbols of

a number of subcarriers to K parallel signals; a signal reproducer for reproducing K parallel

signals by the number L of transmit antennas; *an eigenmode generator for generating*

eigenbeams of the reproduced signals outputted from the signal reproducer at each subcarrier,

on the basis of N.sub.f eigenbeam forming vectors which are fed back long-term and

information of a best eigenbeam forming vector at each subcarrier which is fed back short-

term, through the feedback device; and a plurality of inverse Fourier converters for receiving

the signals outputted from the eigenmode generator and generating an OFDM symbol, all

limitations in combination as defined by applicant.

Claims 1-7 are allowed because the claims are dependent directly or indirectly on claim

1.

Regarding claim 8, the prior art record fails to anticipate or render obvious a MIMO-

OFDM system comprising: a serial/parallel converter for converting continuously inputted

symbols of the number of subcarriers to K parallel signals; a signal reproducer for reproducing K

parallel signals outputted from the serial/parallel converter by the number of transmit antennas;

an eigenbeam calculator for calculating an instantaneous channel covariance and a spatial

covariance matrix by using the uplink channel information, providing N.sub.f dominant

eigenbeam forming vectors from the spatial covariance matrix, and providing the eigenvalue

of the instantaneous channel covariance; an eigenmode selector for selecting an eigenmode of

which the eigenvalue of the instantaneous channel covariance is maximum among N.sub.f,

whenever N.sub.f eigenbeam forming vectors are inputted from the eigenbeam calculator and

the instantaneous channel covariance is updated; and a plurality of inverse Fourier converter for receiving the signals outputted from the eigenmode selector, and generating an OFDM symbol, all limitations in combination as defined by applicant.

Claims 9-11 are allowed because the claims are dependent directly or indirectly on claim 8.

Regarding claim 12, the prior art record fails to anticipate or render obvious a MIMO-OFDM system comprising a transmitter with L transmit antennas, a receiver with M receive antennas, and an uplink feedback device for providing information of the receiver to the transmitter, wherein the transmitter comprises: a serial/parallel converter for converting continuously inputted symbols of a number of subcarriers to K parallel signals; a signal reproducer for reproducing K parallel signals outputted from the serial/parallel converter by the number of transmit antennas; *an eigenmode generator for generating one eigenbeam for each group of subcarriers, on the basis of long-term feedback information corresponding to N.sub.f eigenbeam forming vectors and short-term feedback information corresponding to a group of subcarriers which are provided through the feedback device; and a plurality of inverse Fourier converters for receiving the signals outputted from the eigenmode generator and generating an OFDM symbol,* all limitations in combination as defined by applicant.

Claims 13-19 are allowed because the claims are dependent directly or indirectly on claim 12.

Conclusion

5.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dai A Phuong whose telephone number is 571-272-7896. The examiner can normally be reached on Monday to Friday, 9:00 A.M. to 5:00 P.M..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Edouard can be reached on 571-272-7603. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Dai A Phuong/
Examiner, Art Unit 2617
Date: 04/20/2010